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A

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COMMITTEE ON THE PEACEFUL USES
OF OUTER SPACE

# INTERNATIONAL CO-OPERATION IN THE PEACEFUL USES OF OUTER SPACE - PROGRAMMES OF INTERNATIONAL SPACE ORGANIZATIONS

Note by the Secretariat

1. In accordance with General Assembly resolution 43/56 of 6 December 1988, the Scientific and Technical Sub-Committee of the Committee on the Peaceful Uses of Outer Space, at its 1989 session, re-established the Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82). The report of the Working Group of the Whole on the work of its third session (A/AC.105/429, annex II), which was adopted by the Scientific and Technical Sub-Committee at its twenty-sixth session, contained recommendations which were endorsed by the Committee on the Peaceful Uses of Outer Space in its report, 1/ which was subsequently endorsed by the General Assembly in its resolution 44/46 of 8 December 1989.

2. Among the recommendations, the Working Group of the Whole proposed that the Committee request international organizations with space-related activities to inform the Secretary-General concerning those space activities that could be the subject of greater international co-operation, in order to permit a better assessment of the future of such international co-operation by the Working Group at its next session (A/AC.105/429, annex II, paras. 4 and 4 (d).

3. The United Nations Outer Space Affairs Division subsequently addressed a letter dated 27 June 1989 to all international organizations with space-based activities, requesting them to communicate their comments to the Division, by 1 December 1989. Substantive responses received up to 15 January 1990, from the International Civil Aviation Organization (ICAO), International Maritime Organization (IMO), International Organization of Space Communications (INTERSPUTNIK), International Telecommunication Union (ITU) and the World Health Organization (WHO), are reproduced below.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

[Original: English]

The Special Committee on Future Air Navigation Systems of the ICAO Council completed its work and submitted its final report in May of 1988. The Council agreed with the Committee's recommendations that a satellite-based communications, navigation and surveillance (CNS) system was the key to resolving the shortcomings of the present air navigation system as well as fulfilling the future requirements. It was noted that while a partial implementation of the future CNS system would produce positive results the maximum benefits could only be achieved through a global implementation.

It was recognized that for technical and economical reasons satellite systems require institutional and management arrangements which differ from those presently applied for the conventional air navigation system. Furthermore, realizing that institutional issues could not be usefully considered in general terms and in theoretical isolation, the Council agreed to the formation of a new Special Committee to identify and make recommendations for acceptable institutional arrangements, including funding, ownership and management issues for the global future air navigation system; to develop a global co-ordinated plan, with appropriate guidelines for transition including the necessary recommendations to ensure the progressive and orderly implementation of the ICAO global, future air navigation system in a timely cost-efficient manner; and to monitor the nature and direction of research and development programmes, trials and demonstrations in CNS and air traffic management systems so as to ensure their co-ordinated integration and harmonization.

The formation of the new Special Committee is expected to be completed during the fourth quarter of 1989 and its first meeting is tentatively scheduled for April 1990.

INTERNATIONAL MARITIME ORGANIZATION

[Original: English]

Use of space technology for land, maritime and aeronautical mobile services

The International Maritime Satellite Organization (INMARSAT) system has been in operation since February 1982. The range of services available is steadily increasing. The INMARSAT second-generation satellites are likely to be in operation from the beginning of 1990.

In November 1988 the Maritime Safety Conference convened by IMO adopted amendments to the International Convention for the Safety of Life at Sea (SOLAS), 1974, to introduce the Global Maritime Distress and Safety System (GMDSS). The 1988 SOLAS amendments are expected to enter into force on 1 February 1992. GMDSS will be introduced in stages between 1993 and 1999. Satellite communications form

a major part of GMDSS, and the Conference recommended that ships' satellite equipment (ship-Earth stations (SES) and satellite emergency position-indicating radio beacons (EPIRBs)) be introduced as early as possible.

The organization also continues preparation of a master plan of shore-based facilities for GMDSS.

The further development of GMDSS to provide its orderly introduction will be continued by IMO in close co-operation with ITU/International Radio Consultative Committee (CCIR), the World Meteorological Organization (WMO), the International Hydrographic Organization (IHO), INMARSAT and COSPAS-SARSAT.

A low-altitude near-polar orbiting satellite EPIRB system (COSPAS-SARSAT), operating in the 406-406.1 MHz frequency band, has been established by a number of countries. The agreement between countries which are founding members of the COSPAS-SARSAT system provides a long-term commitment to a satellite-based system providing distress alerting and positioning for search-and-rescue purposes.

IMO has undertaken studies on a world-wide electronic position-fixing system. Amendments to the 1974 SOLAS Convention will be considered when IMO has been satisfied that a suitable world-wide satellite radio-navigation system meeting its requirements is operational.

IMO is also undertaking a study for a world-wide system of transmission and electronic display of nautical information on board ship, including means of updating the electronic navigation chart. INMARSAT has also been invited to consider updating. Target completion date for this study is 1993.

The world-wide satellite-based radio-navigation system as described above will vastly improve maritime communications, strengthen navigational safety and contribute greatly to the efficiency of search-and-rescue operations by all countries, including in particular the developing countries.

## INTERNATIONAL ORGANIZATION OF SPACE COMMUNICATIONS

[Original: English]

The International Organization of Space Communications (INTERSPUTNIK) was set up in 1971. INTERSPUTNIK is an open international organization. At present the Governments of the following 15 countries are members of the organization: Afghanistan, Bulgaria, Hungary, Viet Nam, the German Democratic Republic, Democratic Yemen, Cambodia, Cuba, the Lao People's Democratic Republic, Mongolia, Nicaragua, Poland, Romania, the Union of Soviet Socialist Republics and Czechoslovakia.

The main task of INTERSPUTNIK is to satisfy the demands of the countries for the transmission of different kinds of information using outer space for peaceful purposes on a democratic basis in the interests of all countries concerned.

The supreme and only governing body is the Board, which resolves all problems connected with the organization's activities. The Board is composed of one representative from each member of the organization. Each member of the organization has one vote, irrespective of the amount of its share in the Statutory Fund.

The Directorate is INTERSPUTNIK's permanent executive and administrative body, headed by the Director General, who is the main official of INTERSPUTNIK.

INTERSPUTNIK International System of Satellite Communications

The USSR communications satellites of the "Statsionar-4" (14W00) and "Statsionar-13" (80E00) type are used in the INTERSPUTNIK System of Satellite Communications on a lease basis. The types of Earth stations which operate via these satellites have an antenna diameter of 10-12 m and a figure of merit of G/T $>$31 dB/K.

The Earth stations of both members and non-members of the organization can operate in the system on the basis of tariffs which are uniform for all customers. These tariffs do not exceed the world average. The principal condition necessary for the receipt of the authorization for operation of an Earth station in the system is the conformity of its parameters with the specifications of the INTERSPUTNIK regulations. At present the types of Earth station operating in the INTERSPUTNIK system on a permament basis are located in the USSR (2), Bulgaria, Hungary, the German Democratic Republic, Poland, Czechoslovakia (2), Algeria, Democratic Yemen, Afghanistan, Mongolia, Viet Nam (2), the Lao People's Democratic Republic, Cambodia, Nicaragua, Cuba, the United States of America (2), the Syrian Arab Republic, the Democratic People's Republic of Korea, Iraq and China.

Separate transponders or part of them are allocated by INTERSPUTNIK to countries concerned or other customers for transmitting domestic television programmes, television news, data and other kinds of information.

Pan African News Agency information network

In accordance with the arrangement concluded between INTERSPUTNIK, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Pan African News Agency (PANA) and organizations of the USSR, the PANA information satellite network is being set up with a view to collecting and transmitting the latest news between the principal centre of PANA (Dakar) and five regional centres, in North Africa (Tripoli), West Africa (Lagos), Central Africa (Kinshasa), East Africa (Khartoum) and southern Africa (Lusaka). Taking into account the use of terrestrial connecting lines, this network will cover approximately 50 countries of the African continent.

The network is being set up in two stages. The first stage provides for the construction of Earth stations in Dakar and at one of the regional centres. These stations are planned to be commissioned in 1991. The second stage (1992) provides for the activation of Earth stations at the remaining regional centres. The necessary satellite capacities will be allocated by INTERSPUTNIK with a view to providing the operation of these Earth stations.

READEX FICHE

The Earth stations, equipped with a 4.8-m antenna and a 20-W transmitter, will make it possible for the principal centre of PANA to exchange information in digital form at a rate of 64 kbit/s (telephony, telegraphy, facsimile, data transmission) with all regional centres of the network.

The technical project for the purpose of setting up the PANA information network prepared by the INTERSPUTNIK Directorate was approved by PANA and adopted by UNESCO for financing in stages.

The enterprises of the USSR are providing the development of equipment and the manufacture and delivery of Earth stations for the PANA network.

## INTERNATIONAL TELECOMMUNICATION UNION

[Original: English]

### World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of the Space Services Utilizing It (second session)

The objective of the Orbit Conference, as adopted in resolution No. 3 of WARC-79, was to guarantee in practice for all countries equitable access to the geostationary-satellite orbit and the frequency bands allocated to space services. The Conference was held in two sessions, the first session having taken place in Geneva from 8 August to 15 September 1985.

The first session produced a report that included the principles and methods as well as the technical parameters to be used for planning. It also contained guidelines for the work to be carried out by the permanent organs of the Union in preparation for the second session of the Conference.

The mandate of the second session of the Conference (ORB-88), which was held at Geneva from 29 August to 6 October 1988, was essentially to translate the principles adopted by the first session into a practicable and workable allotment plan that would provide each ITU member country with one orbital position and associated frequencies for one national satellite providing domestic services.

More specifically, ORB-88 had the task of:

(a) Establishing an allotment plan for certain bands of the fixed-satellite service;

(b) Drawing up associated procedures to enable the implementation of the plan;

(c) Simplifying the procedures that had been followed so far to access the geostationary-satellite orbit to be applied to the unplanned bands (articles 11 and 13 of the Radio Regulations);

(d) Drawing up improved procedures which might be applied in the co-ordination process between countries that would be affected by the operation of new satellite networks in certain frequency bands of the fixed-satellite service;

(e) Drawing up a feeder link plan for the Broadcasting-Satellite Service (BSS) for regions 1 and 3 (Europe, Africa and Asia), thus completing a comprehensive world agreement for direct broadcasting satellite service. The various other elements of the agreement such as the down-links for regions 1 and 3 as well as the feeder links and down-links for region 2 are already subject to plans incorporated into the Radio Regulations in 1979 and 1985 respectively.

The Conference was held under the chairmanship of Professor I. Stojanović (Yugoslavia), assisted by seven vice-chairmen, Messrs. S. Bouhadeb (Algeria), Zhiyuan Song (China), P. Martín Leyes Hernández (Colombia), A. R. Bahrainian (Islamic Republic of Iran), J. Dondelinger (Luxembourg), A. L. Badalov (USSR) and T. F. Brophy (United States). Seven committees and one working group of the plenary were set up.

Results of the Conference

The Conference concluded its work on 6 October 1988 by adopting the Final Acts of ORB-88 containing the partial revision of the Radio Regulations and Appendices. This partial revision concerns the following:

Article 1. Terms and definitions;

Article 8. Frequency allocations;

Article 11. Co-ordination of frequency assignments to stations in a space radiocommunication service except stations in the Broadcasting-Satellite Service and to appropriate terrestrial stations;

Article 12. Notification and recording in the Master International Frequency Register of frequency assignments to terrestrial radiocommunication stations;

Article 13. Notification and recording in the Master International Frequency Register of frequency assignments to radio astronomy and space radiocommunication stations except stations in the Broadcasting-Satellite Service;

Article 14. Supplementary procedure to be applied in cases where a footnote in the Table of Frequency Allocations requires an agreement with an Administration;

Article 15A. Co-ordination, notification and recording of frequency assignments to stations in the Fixed-Satellite Service (Earth-to-Space) in the frequency band 17.3-17.8 GHz (in region 2) providing feeder links for the Broadcasting-Satellite Service and also to stations of other services to which this band is allocated in region 2, so far as their relationship to the Fixed-Satellite Service (Earth-to-Space) in this band is concerned in region 2;

Article 27. Terrestrial radiocommunication services sharing frequency bands with space radiocommunication services above 1 GHz;

Article 28. Space radiocommunication services sharing frequency bands with terrestrial radiocommunication services above 1 GHz;

Article 29. Special rules relating to space radiocommunication services;

Article 69. Entry into force of the Radio Regulations;

Appendix 3. Notices relating to space radiocommunication and radio astronomy stations;

Appendix 4. Advance publication information to be furnished for a satellite network;

Appendix 28. Method for the determination of the co-ordination area around an Earth station in frequency bands between 1 GHz and 40 GHz shared between space and terrestrial radiocommunication services;

Appendix 29. Method of calculation for determining if co-ordination is required between geostationary-satellite networks sharing the same frequency bands;

Appendix 30A (ORB-88). Provisions and associated plans for the feeder links for the Broadcasting-Satellite Service (11.7-12.5 GHz in region 1, 12.2-12.7 GHz in region 2 and 11.7-12.2 GHz in region 3) in the frequency bands 14.5-14.8 GHz and 17.3-18.1 GHz in regions 1 and 3, and 17.3-17.8 GHz in region 2 (articles, plans and annexes);

Appendix 30B. Provisions and associated plan for the Fixed-Satellite Service in the frequency bands 4,500-4,800 MHz, 6,725-7,025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz (articles, plans and annexes).

In accordance with its agenda, the Conference took other decisions considered necessary or appropriate, including the review and revision of existing resolutions and recommendations and the adoption of various new resolutions and recommendations, including a resolution dealing with multilateral planning meetings (MPM).

Entry into force of the Final Acts

The partial revision of the Radio Regulations which includes the plan for the feeder links for the Broadcasting Satellite Service (BSS) in regions 1 and 3 as contained in the Final Acts of ORB-88 will enter into force on 16 March 1990 at 0001 h universal co-ordinated time (UTC) except as specifically provided otherwise. The Allotment Plan will remain valid for a period of at least 20 years from the date of entry into force of the Final Acts or until a revision is made by a competent conference. The BSS Feeder Link Plan will remain valid until at least 1 January 1994 or until a revision is made by a competent conference.

WORLD HEALTH ORGANIZATION

[Original: English]

## Disaster management as a platform for the peaceful uses of outer space

Prompt communication of relevant information is recognized as a basic requirement for an effective response to disasters and other emergencies and in their preparedness. Since 1987, WHO has been promoting disaster management in a programmatic framework with a view to developing national capabilities in recognizing the problems and their impact, effective utilization of available resources, assessing additional resource needs and gaining access to external sources for support. Among other areas, WHO has also intensified its efforts in developing at national and international levels, disaster management information systems as a component of national health information systems that contain critical information for emergency preparedness and response with efficient telecommunication support for their collection and communication for national and international use. While the United Nations International Emergency Network UNIENET, as a public telecommunication network, has been functioning as a disaster-specific electronic information network to facilitate the central disaster relief co-ordination activities of the United Nations, there is an urgent need to link the disaster area with the national disaster management centre for rapid communication of information to facilitate prompt decision and effective action. The Pan American Sanitary Bureau, which is the WHO Regional Office for the Americas, used a portable satellite transmitter for a hurricane warning in the Caribbean and found the cost of that exercise to be prohibitive. In the context of the rehabilitation programme following the earthquake in Armenia, USSR, the WHO Regional Office for Europe tested, with the assistance of IMMARSAT, a Standard-C System that supported a low-cost world-wide telex service through satellite communication using an existing telex network through a ground station for 24 hours a day. Given its extreme durability, easy portability and relatively less expensive technology, it is envisaged to include, subject to further testing in real disaster situations, this system as an essential tool for disaster management purposes.

### Objective

The overall objective is to identify and develop appropriate tools and techniques to improve the information and communication support for disaster management.

The specific objective is to test, in real disaster situations, the feasibility and effectiveness of the Standard-C Satellite Transceiver System in communicating information from the disaster area to the national disaster centre and to the WHO regional office concerned and/or WHO Geneva.

### Duration

The feasibility study is for a period of two years, e.g., from June 1990. By the end of 1992, it should be possible to decide on the appropriateness of the system for wider use.

Approach

At least six disaster-prone countries, preferably covering all WHO regions and different types of disasters, will be selected. Each country will be provided with a Standard-C System, possibly TT-3020A (Trane and Trane), which is considered to be the latest version with regard to technology, easily portable, weighing about 7 kg and costing approximately $US 5,000, and an IBM-compatible portable laptop personal computer or an MS-DOS compatible micro-computer as a user terminal with a printer. This is considered to be an excellent system for the mobile requirements for years to come as it allows communication between trucks, ships, trains and rural areas with a DC power source of 11-23 vdc, 15/50 W.

A disaster-area profile will be developed, data collection instruments devised and hazard mapping carried out. They will be adapted to country situations, and with the completion of data collection a disaster will be simulated as a part of disaster preparedness exercise. Based on this experience, further modifications will be made, relevant staff will be trained and the system will be prepared to function effectively once the disaster strikes.

Time frame and resource needs

The study will have four phases, viz.:

| | | |
|---|---|---|
| 1. | Development of forms and procedures and procurement of equipment | 3 months |
| 2. | Data collection and training, including installation | 3 months |
| 3. | Simulation exercise and modifications | 1 month |
| 4. | Real disaster situation test and evaluation | 12 months |

It is envisaged that this study will cost approximately $US 200,000, viz.:

| | $ |
|---|---|
| Six sets of Satellite C System, including computers | 120 000 |
| Training | 60 000 |
| Technical support including travel | 20 000 |

A detailed list of activities, including a plan of work and resource breakdown, is being prepared in consultation with the relevant headquarters divisions and regional offices concerned.

Notes

1/ Official Records of the General Assembly, Forty-fourth Session, Supplement No. 20 (A/44/20).

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COMMITTEE ON THE PEACEFUL USES
OF OUTER SPACE

# REGIONAL AND INTERNATIONAL EDUCATION, TRAINING AND RESEARCH CENTRES IN SPACE SCIENCE AND TECHNOLOGY AND ITS APPLICATIONS

Report by the Secretariat

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## INTRODUCTION

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2. The present document was prepared by the Outer Space Affairs Division of the United Nations Secretariat in accordance with paragraph 5 (b) of the report of the Working Group of the Whole, in which it was requested that the Division should update annually the report on the existing training centres at the regional level.

## I. REMOTE SENSING

### A. ECONOMIC COMMISSION FOR AFRICA*

#### (1) CENTRE REGIONAL DE TELEDETECTION DE OUAGADOUGOU, BURKINA FASO

Place du Centre, B.P. 1762, Ouagadougou, Burkina Faso

Numéro de télex : 5322 — Téléphone : 334945, 335091, 335139 — Adresse télégraphique: -

Responsable : Directeur de la Formation

Vocation(s) principale(s) de votre établissement : Formation/assistance prestation de services aux utilisateurs/distribution de donnees

(a) PROGRAMMES DE CULTURE GENERALE ET SCIENTIFIQUES

Description des cours et activités de recherche :

Cours : Base physique de la télédétection; observation stéréoscopique; vecteurs et capteurs; traitements photographiques et méthode d'analyse; restitution des informations; statistiques et

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* Additional information provided by the Economic Commission for Africa (ECA) in respect of the three regional centres in Burkina Faso, Kenya and Nigeria is to be found in the annex to the present report.

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notions d'informatique; traitement numérique des images; travaux pratiques sur un système de traitement; stage de terrain

Activités de recherche : Mesures radiométriques sur pâturages et cultures vivrières; inventaire des ressources en eau; statistiques agricoles et suivi de pâturages; télédétection et cartographie censitaire

Durée/Fréquence/Langue(s) d'enseignement : 6 mois/2 fois par an/anglais, français

Répartition du temps alloué en salle de classe/laboratoire/travail sur le terrain/recherche indépendante : 35%/40%/20%/5%

Moyens dont dispose l'établissement pour exécuter les programmes : Laboratoire photographique; documentations, cartes, images, archives; bientôt une unité de traitement

Nombre de participants : Entre 5 et 20

Critères régissant l'admission : BAC + ans (Technicien Supérieur)

Certificats ou diplômes obtenus : Attestation de stage

(b) COUT DES PROGRAMMES

Frais de scolarité, manuels et autres matériaux de recherche : 3 000 000 francs CFA/stage 6 mois

Frais mensuels de logement et de subsistance et faux frais : 71 000 francs CFA/mois

(c) POSSIBILITES DE BOURSES D'ETUDES OU DE PERFECTIONNEMENT

Possibilités de bourses d'études ou de perfectionnement pour des participants étrangers : Non

Existence d'autres possibilités d'octroi d'une aide financière pour participants étrangers : Non

(d) COLLABORATION AVEC PAYS EN DEVELOPPEMENT : Oui

Domaines qui vous intéressent : -

Préférence géographique: Afrique de l'Est; Asie, Amérique (Brésil/Argentine)

/...

(2) REGIONAL CENTRE FOR SERVICES IN SURVEYING, MAPPING AND REMOTE SENSING, KENYA

P.O. Box 18118, Nairobi, Kenya

Telex: 25285 Tel.: 803320 Cable: -

Contact person: Director of Remote Sensing

Principal function(s) of institution: Training, research, development and technical services

(a) ACADEMIC AND SCIENTIFIC PROGRAMMES

Summary of courses and research activities:

Training: Applications of remote sensing to agriculture, forestry, hydrology, geology and minerals, oceanography, cartography, highway road construction, soils environmental monitoring, natural and man-made disasters, pests; teaching with remote sensing; consultancy services and project design

Research: Use of geographical information; system of land use in East and southern Africa; photo-mapping techniques; digital techniques and analysis; food yield prediction techniques

Duration/Frequency/Language(s) of instruction: 3-6 weeks/6 times a year/English; 3-6 weeks/twice a year/French

Allocation of time spent in classroom/laboratory/field work/independent research: 40%/30%/10%/20%

Facilities: Basic physical infrastructure services and teaching photo laboratory for imagery processing; computer facilities (soon to be installed); field survey equipment and transport; aerial cameras (large and small format)

Number of trainees: Between 15 and 25

Entry requirement: 1st or 2nd degree in natural resources sciences

Degree/Diploma/Certificate awarded: None*

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* Negotiating academic awards of the International Institute for Aerial Survey and Earth Sciences (ITC).

(b) COST OF PROGRAMMES

Cost of tuition, texts and related research material: Approximately $US 2,000 per participant per course

Monthly room and board and incidental expenses: Included above

(c) SCHOLARSHIP/FELLOWSHIP OPPORTUNITIES

Scholarship/Fellowship opportunities for foreign participants: None

Other financial support available for foreign participants: United Nations agencies, donor agencies

(d) COLLABORATION WITH DEVELOPING COUNTRIES: Yes

Specific areas of interest: -

Geographical preference: -

(3) REGIONAL CENTRE FOR TRAINING IN AERIAL SURVEYS, NIGERIA

P.M.B. 5545, Ile-Ife, Nigeria

Telex: 34262 RECTAS NG Tel.: 036-230-050 Cable: AEROCENTRE

Contact person: Prof. O. O. Ayeni, RECTAS, P.M.B. 5545, Ile-Ife, Nigeria

Principal function(s) of institution: Training, research and consultancy

(a) ACADEMIC AND SCIENTIFIC PROGRAMMES

Summary of courses and research activities:

Training: Post-graduate course in remote sensing and technician course in remote sensing

Research: Applications of remotely sensed data to earth resources evaluation

Duration/Frequency/Language(s) of instruction:
9 months/12 months/English, French

Allocation of time spent in classroom/laboratory/field work/independent research: 208 hrs/250 hrs/3 months/-

Facilities: Remote sensing and cartographic equipment, photo-reproduction

Number of trainees: Between 10 and 30

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Entry requirement: Technician's level plus experience in the relevant field of specialization

Degree/Diploma/Certificate awarded: Academic diploma

(b) COST OF PROGRAMMES

Cost of tuition, texts and related research material: Costs of tuition, lodging, teaching, books and insurance to be obtained by writing to the Director of Centre

Monthly room and board and incidental expenses: Included above

(c) SCHOLARSHIP/FELLOWSHIP OPPORTUNITIES

Scholarship/Fellowship opportunities for foreign participants: Netherlands fellowships

Other financial support available for foreign participants: British Council

(d) COLLABORATION WITH DEVELOPING COUNTRIES: Yes

Specific areas of interest: Application of remotely sensed data to earth resources evaluation

Geographical preference: Africa region

B. ASIAN INSTITUTE OF TECHNOLOGY

INRDM Programme

P.O. Box 2754, Bangkok 10501, Thailand

Telex: 84276 TH Tel.: 529-0100-13 Cable: AIT BANGKOK
Fax: 529-0374

Contact person: Co-ordinator

Principal function(s) of institution: Training and education

(1) ACADEMIC AND SCIENTIFIC PROGRAMMES

Summary of courses and research activities:

Courses:

(a) 13-week training course: basic electromagnetic theory, visual and digital airphoto and satellite interpretation, field work for verification of maps produced using remote-sensing data

(b) 13-week training course: geographic data: spatial and thematic characteristics, structures and processing; data bases: information sources, integrity and accuracy; construction of landscape models; manual and computer-assisted systems; integration with image processing systems; current GIS descriptions and evaluation. Team projects focus on uses of GIS for development and management of natural resources in developing countries

(c) Workshop in remote-sensing image processing using micro-computers: stresses practical (laboratory) work

(d) Workshop in GIS using micro-computers: stresses practical (laboratory) work

Research:

(a) A pilot project on surface water inventory and evaluation in north-east Thailand using Landsat satellite data

(b) An analysis of the utility of SPOT satellite data for the production of thematic maps used for planning the agricultural development of the Vientiane plain in Laos

(c) A study of the effect of deforestation and agricultural land use on the nutrient level and suspended solids load of tropical streams

(d) An analysis of the utility of remote-sensing data for the identification of different types of geomorphologic units in Thailand

(e) Integration of systems dynamics modelling with GIS static spatial models for spatial analysis of statistical output from dynamic simulations

Duration/Frequency/Language(s) of instruction:

Certificate: 3-1/2 months/2 per year/English (for remote sensing and GIS each)

Workshops: 3 weeks/1 per year/English (for remote sensing and GIS each)

Allocation of time spent in classroom/laboratory/field work/independent research:

Certificate: 25%/37%/8%/30% (team project - remote sensing)
43%/16%/8%/32% (team project - GIS)

Workshop: 50%/50%

Facilities: The following work stations have a wide array of input-output devices (including tape and disk drives, digitizing tables, printers and ink-jet plotters, and a stand-alone Optronics scanner-plotter system):

| Software | No. of work stations and graphics controllers | CPU host computer |
|---|---|---|
| DIMAPS/MAP (IPS) | (2) Ramtek 512x512 | IBM 3083 Mainframe |
| MicroVips (IPS) | (1) Numelec Pericolour 2001 512x512 | DEC MicroVax II Mini |
| | (1) Geode 1024x1024 | |
| ERDAS (IPS and GIS) | (2) Revolution No. 9 512x512 | NEC APC-IV Powermate I (80287) Micro |

The Optronics Colorwrite is the primary output device for research products from these systems. Up to 30"x40" colour or black-and-white enlargements can be printed from Optronics masters, using Wing-Lynch film processing and Kreonite print processing equipment. In addition, pcMAP (GIS), PAMAP (GIS), and DRAGON (IPS), plus GIS and IPS tutorial systems developed at AIT are installed on the eight NEC APC-IV Powermate I (80287 math co-processor) work stations in the INRDM/RSL micro-computer classroom. The work stations use EGA graphics cards with NEC Multisync RGB monitors

Number of trainees: Between 10 and 30 in each certificate course or workshop (for remote sensing and GIS)

Entry requirements: Undergraduate degree or diploma

Degree/Diploma/Certificate awarded: Certificate of attendance (3-1/2 month programme and workshop)

(2) COST OF PROGRAMMES

Cost of tuition, texts, field work and related research material:

(a) Certificate programme: $US 3,200

(b) Workshop: - (included in tuition)

Monthly room, board and incidental expenses:

(a) Certificate programme: $US 240 ($US 960 per programme)

(b) Workshop: - (included in tuition)

(3) SCHOLARSHIP/FELLOWSHIP OPPORTUNITIES

Scholarship/Fellowship opportunities for participants: 6 to 12 per year for remote sensing; 1 to 6 per year for GIS

Other financial support available for participants: Some travel scholarships may also be available

(4) COLLABORATION WITH DEVELOPING COUNTRIES: Yes

Specific areas of interest: Remote sensing, geographic information systems, digital cartography, and DEM

Geographical preference: Asia and the Pacific

C. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

REMOTE SENSING CENTRE

Via delle Termi di Caracalla, 00100 Rome, Italy

Telex: 61081 FAO I Tel.: 57975583 Cable: FOODAGRI ROME
Fax: 5146172-57973152

Contact person: Chief, Remote Sensing Centre

Principal function(s) of institution: Technology transfer, environmental monitoring, field projects support

(1) ACADEMIC AND SCIENTIFIC PROGRAMMES

Summary of courses and research activities:

Short courses: (2-4 weeks duration) on remote-sensing applications at interregional, regional/subregional and national level in co-operation with UN(OSAD), WMO, UNDRO, UNESCO, UNEP, ESCAP, ESA, Member States (e.g. Italy, Federal Republic of Germany, France) and regional remote-sensing centres

Specialized on-the-job training: Analog and digital image analysis techniques

Development and testing of techniques for application in developing countries (pilot action studies)

Duration/Frequency/Language(s) of instruction: 2-4 weeks/8-9 courses per year/English, French, Spanish, Arabic, Chinese

Allocation of time spent in classroom/laboratory/field work/independent research: 40%/40%/20%/-

Facilities: Comprehensive range of equipment for analog and digital analysis of remote-sensing data, reproduction of imagery and thematic mapping; complete training facilities for 24 participants

Number of trainees: Between 15 and 24

Entry requirements: University degree in relevant discipline

Degree/Diploma/Certificate awarded: Attendance certificate

(2) COST OF PROGRAMMES

Cost of tuition, texts and related research material: Free (no stipend paid)

Monthly room and board and incidental expenses: Provided unless in host country

(3) SCHOLARSHIP/FELLOWSHIP OPPORTUNITIES

Scholarship/Fellowship opportunities for foreign participants: Several a year. FAO provides fellowships under its executed field projects in developing countries

Other financial support available for foreign participants: Return travel covered for selected participants

(4) COLLABORATION WITH DEVELOPING COUNTRIES: Yes

Specific area of interest: Since 1972 the Remote Sensing Centre has been assisting Member States in applying remote-sensing technology to a wide spectrum of renewable natural resources, particularly as related to agriculture, fisheries and forestry

Geographical preference: Developing countries with priorities assigned according to their needs

D. UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

7, place de Fontenoy, 75700 Paris, France

Telex: 204461 PARIS Tel.: (33.1) 568.10.00 Cable: UNESCO PARIS

Contact person: Mr. N. Pham, DADG/SC/OPS, UNESCO

Principal function(s) of institution: -

(1) ACADEMIC AND SCIENTIFIC PROGRAMMES

Summary of courses and research activities:

Courses: The following post-graduate training courses sponsored by UNESCO and dealing with the application of remote sensing in integrated natural resources research, management and development will continue for the next few years:

(a) International post-graduate training course in integrated surveys at the International Institute for Aerial Survey and Earth Sciences (ITC), in Enschede, Netherlands;

(b) Post-graduate course in integrated study and rational use of natural resources, at the universities of Paris, Montpellier and Toulouse, France;

(c) International post-graduate training courses on remote-sensing applications and digital image processing at ITC in Enschede, Netherlands;

(d) International post-graduate training course in photo-interpretation applied to civil engineering and to geology, at the Centro Interamericano de Foto Interpretación in Bogotá, Colombia.

Apart from these regular courses, financial contributions are made by UNESCO for holding ad hoc training courses and workshops as follows:

(a) Training courses on the applications of remote sensing to oceanography are planned for the African region and the region comprising the Mediterranean, the Red Sea and the adjacent gulfs of the Indian Ocean;

(b) A Regional Remote Sensing Workshop was held at Nairobi in 1988. This workshop was devoted to the analysis of research carried out under the UNESCO/International Union of Geological Sciences (IUGS) Programme "Geological Applications of Remote Sensing" (GARS);

(c) Training courses on remote-sensing applications in the field of ecology and hydrology have been envisaged for execution in 1986-1989.

Research:

(a) Research activities are organized in the framework of the International Hydrological Programme. These activities focus on the application of remote sensing in the study of water resources;

/...

(b) Research is currently being undertaken in the framework of the UNESCO/International Union of Geological Sciences (IUGS) Programme "Geological Applications of Remote Sensing". Two research projects were launched in 1984. The first focuses on the comparative use of remote-sensing data from different sensors in the geological mapping of the Kibaran terrains in East and Central Africa and is closely related to field studies organized under the UNESCO major regional project "Geology for Economic Development". The second project will be implemented in South America, and it consists of evaluating the use of remote-sensing data for geological mapping and mineral exploration in heavily vegetated zones.

Duration/Frequency/Language(s) of instruction: 3 weeks/annually/French, English

Allocation of time spent in classroom/laboratory/field work/independent research: For short courses 40%/50%/10%/-; for longer courses, a considerable amount of time is allocated for independent work

Facilities: Assistance to facilitate the exchange of scientists and information and limited assistance for the development of the scientific infrustructure

Number of trainees: Number varies, not more than 25

Entry requirement: BSc in geology or hydrology or marine sciences is required to be able to participate in remote-sensing programmes related to the respective scientific disciplines

Degree/Diploma/Certificate awarded: Certificates are issued upon successful completion of the short courses. Diplomas are awarded at the end of the long-term programmes

(2) COST OF PROGRAMMES

Cost of tuition, texts and related research material: Normally, tuition fees or textbook costs are borne by UNESCO

Monthly room and board and incidental expenses: Vary according to the programme

(3) SCHOLARSHIP/FELLOWSHIP OPPORTUNITIES

Scholarship/Fellowship opportunities for foreign participants: Fellowships are available for training programmes enumerated in the summary of courses

Other financial support available for foreign participants: -

(4) COLLABORATION WITH DEVELOPING COUNTRIES: Yes

Specific areas of interest: Remote sensing related to geology, hydrology and oceanography

Geographical preference: None

E. EUROPEAN SPACE AGENCY

8-10, rue Mario-Nikis, 75738 Paris Cedex 15, France

Telex: ESA 202746 Tel.: (33.1) 4 273.7459 Cable: SPACEUROP PARIS

Contact person: Head of International Affairs Branch

Principal function(s) of institution: Research and development

(1) ACADEMIC AND SCIENTIFIC PROGRAMMES

Summary of courses and research activities:

Courses: ESA has been a co-sponsor of international training courses in remote sensing with the United Nations, WMO, FAO, UNDRO, RRSF, ASECNA; Asia: AIT, Asian Development Bank, ESCAP; Africa: CRTO, RCCRS, Synymeth, African Development Bank; Latin America: INPE, CNIE, CLIRSEN, Augustin Lodazzi

Research: Different areas in remote sensing

Duration/Frequency/Language(s) of instruction: 2-3 weeks/-/English, French, Spanish

Allocation of time spent in classroom/laboratory/field work/independent research: Fully dependent on the topic

Facilities: Broad range of facilities is available

Number of trainees: 20-25 participants for each training course

Entry requirement: Experienced scientists, engineers, technicians

Degree/Diploma/Certificate awarded: Certificate of attendance

(2) COST OF PROGRAMMES

Cost of tuition, texts and related research material: None

Monthly room and board and incidental expenses: None

(3) SCHOLARSHIP/FELLOWSHIP OPPORTUNITIES

Scholarship/Fellowship opportunities for foreign participants: 1 per year; fellowship offered under the auspices of the United Nations Space Applications Programme

Other financial support available for foreign participants: None

(4) COLLABORATION WITH DEVELOPING COUNTRIES: Yes

Specific areas of interest: Remote sensing

Geographical preference: None

## II. SATELLITE COMMUNICATIONS

### A. EUROPEAN SPACE AGENCY

8-10, rue Mario-Nikis, 75738 Paris Cedex 15, France

Telex: ESA 202746 Tel.: (33.1) 4 273.7459 Cable: SPACEUROP PARIS

Contact person: Head of International Affairs Branch

Principal function(s) of institution: Research and development

(1) ACADEMIC AND SCIENTIFIC PROGRAMMES

Summary of courses and research activities:

Courses: Courses on the use of space technology for communications in developing countries in co-ordination with PATU and UAPT

Research: Different areas in satellite communications

Duration/Frequency/Language(s) of instruction: 3 months/twice a year/French, English

Allocation of time spent in classroom/laboratory/field work/independent research: Fully dependent on the topic

Facilities: Broad range of facilities is available

Number of trainees: 5-6 for each training course

Entry requirement: Experienced engineers, technicians

Degree/Diploma/Certificate awarded: Certificate

/...

(2) COST OF PROGRAMMES

Cost of tuition, texts and related research material: None

Monthly room and board and incidental expenses: None

(3) SCHOLARSHIP/FELLOWSHIP OPPORTUNITIES

Scholarship/Fellowship opportunities for foreign participants: Two per year; fellowship offered under the auspices of the United Nations Space Applications Programme

Other financial support available for foreign participants: None

(4) COLLABORATION WITH DEVELOPING COUNTRIES: Yes

Specific areas of interest: Satellite communications

Geographical preference: None

## III. SATELLITE METEOROLOGY

### A. EUROPEAN SPACE AGENCY

8-10, rue Mario-Nikis, 75738 Paris Cedex 15, France

Telex: ESA 202746 Tel.: (33.1) 4 273.7459 Cable: SPACEUROP PARIS

Contact person: Head of International Affairs Branch

Principal function(s) of institution: Research and development

(1) ACADEMIC AND SCIENTIFIC PROGRAMMES

Summary of courses and research activities:

Courses: ESA has been a co-sponsor of international training courses in satellite meteorology related to Meteosat use with the United Nations, WMO, FAO, UNDRO, RRSF, CRTO, ASECNA, and RCSSMRS

Research: Different areas in satellite meteorology, particularly Meteosat

Duration/Frequency/Language(s) of instruction: 3 weeks/annually/English, French

Allocation of time spent in classroom/laboratory/field work/independent research: Fully dependent upon the topic

Facilities: Broad range of facilities is available

/...

Number of trainees: 20-25 participants for each training course

Entry requirement: Experienced Earth observation experts

Degree/Diploma/Certificate awarded: Certificate of attendance

(2) COST OF PROGRAMMES

Cost of tuition, texts and related research material: None

Monthly room and board and incidental expenses: None

(3) SCHOLARSHIP/FELLOWSHIP OPPORTUNITIES

Scholarship/Fellowship opportunities for foreign participants: 1 per year; fellowship offered under the auspices of the United Nations Space Applications Programme

Other financial support available for foreign participants: None

(4) COLLABORATION WITH DEVELOPING COUNTRIES: Yes

Specific areas of interest: Satellite meteorology

Geographical preference: None

## Notes

1/ Official Records of the General Assembly, Forty-fourth Session, Supplement No. 20 (A/44/20), para. 28.

Annex

NOTE ON THE REGIONAL TRAINING CENTRES IN AFRICA

The three operational regional centres conducting training in space science technology applications in Africa were established at Ile-Ife, Nairobi and Ouagadougou in 1972, 1975 and 1977 respectively. Their establishment was in response to member States' expressed need, in the form of resolutions which were later approved by the Conference of Ministers responsible for Economic Planning and Development, to produce skilled personnel in cartography and remote sensing for the exploration, exploitation and management of their natural resources through short- and long-term training courses.

Objectives

The main objectives of the centres as far as remote-sensing technology applications are concerned are as follows:

(a) To provide theoretical and practical training in the field of aerospace surveys, namely photogrammetry, photo-interpretation, cartography and remote-sensing applications;

(b) To conduct seminars and workshops of various durations with a view to providing an opportunity for the exchange of information and experience in the field of remote-sensing applications;

(c) To provide consultancy and technical advisory services to the member States;

(d) To develop and increase the capability of the centres so as to be able to generate revenue, thereby considerably reducing their dependence on contributions for member States and the donor countries and organizations;

(e) To engage in research, the results of which are to be widely disseminated among the members of the Economic Commission.

Programme of work

In order to fulfil the objectives of the centres, each one prepares a development plan for a specific period, e.g. three or five years, which is then considered and approved by its Governing Council or Regional Management Committee.

The Regional Centre for Training in Aerospace Surveys (RECTAS), at Ile-Ife, has developed a separate curriculum for each of the following training courses which it conducts: operators', technicians' and technologists' programmes and post-graduate diploma in photogrammetry, cartography and remote sensing. These courses are offered in English and French, as the centre is bilingual. In the case of the Regional Centre for Services in Surveying, Mapping and Remote Sensing (RCSSMRS) at Nairobi, the training is normally conducted for a short period and is

/...

usually tailored to the needs of the member States in the subregion. Emphasis is therefore placed upon the application of remote-sensing data in natural resources projects such as food production, forestry, water resources development and land use management. The Regional Centre at Ouagadougou, on the other hand, is mainly user assistance oriented and trains graduates involved in natural resources planning and development. Regular six-month courses were extended to nine months as of October 1986. These courses cover the entire programme in remote-sensing applications.

Another important aspect of the work programmes of the centres is the provision for consultancy services to member States by offering advice on the choice of equipment, establishment of their national remote-sensing units and remote-sensing data appropriate for their needs.

Financial resources

The financial resources for the implementation of the development plans come from three main sources: contributions of member States, funds generated by the centres and contributions from donor countries and agencies.

| | RCSSMRS 1986-1991 | RECTAS 1988-1992 |
|---|---|---|
| | ($US) | ($US) |
| (a) Contributions from signatory member States | 4 500 000 | 4 267 414 |
| (b) Own revenue through services | 5 000 000 | 901 259 |
| (c) Technical assistance | 6 000 000 | 3 366 154 |
| | 15 500 000 | 8 534 827 |

Although the Ouagadougou Regional Remote Sensing Centre (CRTO) has an approved development plan for a four-year period (1988-1991), only the figure for the budget for 1988, amounting to 410,545,000 CFA francs, is available at the time of writing.

Accomplishments to date

In spite of the limitations imposed by an inadequacy of funds resulting from the failure to contribute and even the falling into arrears by some of the member countries, the centres have been able to acquire some modest equipment, ranging from photogrammetric plotters and photo-interpretation instrumentation to micro-computers and digital image processing devices.

In the field of training, the achievements of the centres are as follows: RECTAS trained 98 African nationals in photogrammetry and photo-interpretation between 1981 and 1986; in Nairobi, 650 participants attended courses in remote-sensing applications during the same period; and at the Ouagadougou regional centre, 228 received training between 1978 and 1986.

Singly or in conjunction with international organizations, the centres have held several conferences, workshops and seminars on remote-sensing applications and cartography for national and/or regional development. They have also contributed enormously to raising the member States' awareness of the potential uses of the information derived from airborne and space-borne remote-sensing data for development and management.

Anticipated activities in the next two years

The main objectives of the centres remain training in remote-sensing technology and its applications in various fields such as agriculture, urban and rural planning, natural resources development and management and environmental monitoring. Therefore, training activities will be continued in the next biennial period in the form of regular and special courses of various durations.

Moreover, the centres will provide technical advisory and consultancy services to the member States and will participate actively in carrying out studies and undertaking pilot projects in the two disciplines so as to generate funds to cover part of their expenditure. In addition, they will be consolidating their operations by improving their facilities in order to increase their effectiveness in responding to the needs of the member States.

Review of services of member States

RECTAS and RCSSMRS have Governing Councils whose membership is derived from the participating member States. CRTO has a Regional Management Committee at the ministerial level. These organs meet at least once a year to perform the functions mentioned above.

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UNITED NATIONS

A

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COMMITTEE ON THE PEACEFUL USES
OF OUTER SPACE

# IMPLEMENTATION OF THE RECOMMENDATIONS OF THE UNISPACE 82 CONFERENCE

Report by the Secretariat in response to the request of the Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space

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## INTRODUCTION

1. The Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, in its report on the work of its third session (1989) (A/AC.105/429, annex II) made the following recommendation:

> "6. The Working Group recommended that the Outer Space Affairs Division prepare a report for the next session of the Scientific and Technical Sub-Committee indicating which of the UNISPACE 82 recommendations, addressed to the United Nations, had not yet been implemented."

2. That report and its recommendations were adopted by the Scientific and Technical Sub-Committee in its report on the work of its twenty-sixth session (A/AC.105/429, para. 24), endorsed by the Committee on the Peaceful Uses of Outer Space at its thirty-second session, 1/ and endorsed by the General Assembly in its resolution 44/46 of 8 December 1989.

3. The report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82), including the recommendations, is contained in document A/CONF.101/10 and Corr.1 and 2. 2/ That report does not contain a separate list of recommendations, but includes them as part of the considerations of the various agenda items. The Conference did not indicate any priorities with respect to the recommendations. For the convenience of delegations to the Conference, the UNISPACE 82 secretariat prepared a summary compilation of the recommendations of the Conference in document A/CONF.101/11. That summary listing has been used as a basis for the present report.

4. The summary listing of the recommendations in document A/CONF.101/11 grouped the recommendations in two groups: recommendations addressed to Member States; and recommendations addressed to international agencies or bodies. It is only the recommendations addressed to international agencies or bodies that are considered in the present report. In some cases, the Conference made recommendations without indicating who they were addressed to, in which case the UNISPACE 82 secretariat placed them in the group that seemed most appropriate.

5. UNISPACE 82 adopted over 120 recommendations, of which 69 were explicitly or implicitly addressed to international organizations. Of those addressed to international organizations, 42 were addressed to the United Nations, 13 were addressed to the specialized agencies and 13 were addressed to other international organizations. The present report will focus on the 42 recommendations addressed to the United Nations. Since the recommendations were not numbered in the UNISPACE 82 report, they will be referred to in the present report by the paragraph number of the UNISPACE 82 report. 1/

6. As will be described in the present report, the United Nations has made efforts to implement, at least in part, virtually all of the recommendations addressed to it. There are, therefore, almost no recommendations that have not, strictly speaking, been implemented. However, owing to the limited resources

available to the United Nations for the implementation of the UNISPACE 82 recommendations, many of those recommendations have not been fully implemented. Furthermore, many of the recommendations concern open-ended and ongoing activities that could never be considered to be definitively and completely implemented. The present report, therefore, will review all of the recommendations addressed to the United Nations and will indicate in each case the efforts that have been made to implement them and, where appropriate, the additional efforts that would be required to implement them more fully. While further implementation of many of the recommendations are planned within the existing budget of the United Nations, additional resources would be required for a more complete implementation.

7. Recommendations addressed to international organizations other than the United Nations are contained in the annexes to the present report. Recommendations specifically addressed to specialized agencies of the United Nations system are contained in annex I, and the recommendations addressed to other international organizations are contained in annex II. These annexes have been transmitted to the specialized agencies and other international organizations concerned with space activities in order to obtain further information on the implementation of the UNISPACE 82 recommendations. As such information is received, it will be provided to the Committee.

## I. STUDIES

8. In accordance with the decisions of the Committee, the secretariat has carried out a number of studies recommended by UNISPACE 82. In particular, shortly after the Conference, the Committee requested the secretariat, with the assistance of international groups of experts, to carry out three of the recommended studies on a priority basis. The resulting studies were submitted to the Committee at its twenty-eighth session, in 1985. The three studies concerned: assistance to countries in studying their remote sensing needs and assessing appropriate systems for meeting those needs (A/AC.105/339/Rev.1, in response to para. 173 of the UNISPACE 82 report); the feasibility of obtaining closer spacing of satellites in the geostationary orbit (A/AC.105/340/Rev.1, in response to para. 66); and the feasibility of using direct broadcasting satellites for educational purposes and of internationally or regionally owned space segments (A/AC.105/341/Rev.1, in response to para. 249).

9. Two other studies were prepared by other international organizations for the Committee specifically in response to UNISPACE 82 recommendations. A study on the environmental effects of space activities (A/AC.105/344, in response to paras. 135 and 294) was prepared by the Committee on Space Research (COSPAR) of the International Council of Scientific Unions (ICSU); and a study on the implications to international co-operation of large-scale space systems (A/AC.105/349, in response to para. 144) was prepared by the International Astronautical Federation (IAF).

10. While the studies indicated in paragraphs 8 and 9 above were carried out as recommended by UNISPACE 82, it should be kept in mind that, in the rapidly changing field of space technology and applications, such studies become outdated in 5 to 10 years.

11. The secretariat has also prepared a number of reports in accordance with the recommendations of the Working Group of the Whole and in the context of the UNISPACE 82 recommendations, but not specifically corresponding to particular recommendations of the Conference. These include reports on measures necessary for improving education in space technology and applications in developing countries (A/AC.105/394); information systems on space science and technology (A/AC.105/397); and measures which should be taken by the Committee for enhancing the use of space applications for development (A/AC.105/398). Also in response to a recommendation of the Working Group of the Whole, COSPAR and IAF prepared for the Committee a report on the environmental effects of space activities (A/AC.105/420) as a follow-up to an earlier COSPAR report (A/AC.105/344).

12. A large number of other international, regional and national organizations have carried out studies on topics generally relating to UNISPACE 82 recommendations. Information relating to or deriving from some of these studies has been submitted to the Committee in reports by Member States, in the annual reports submitted by COSPAR and IAF (most recently in documents A/AC.105/452 and A/AC.105/453, respectively), by specialized agencies and by other international space organizations that contribute to the work of the Committee.

13. The seminars, workshops and meetings of experts organized as part of the United Nations Programme on Space Applications have also addressed topics generally related to the UNISPACE 82 recommendations, and reports on those meetings have been submitted to the Committee on the Peaceful Uses of Outer Space. Those meetings and reports will be mentioned in appropriate sections of the present report.

14. These studies and reports submitted to the Committee on the Peaceful Uses of Outer Space have addressed, at least partially, all of the studies recommended by UNISPACE 82. In some cases, however, only part of the subject has been addressed, or different aspects of the subject have been addressed in a number of reports. In the case of priority subjects, it might be desirable to integrate information from different reports and compile new information in order to provide Member States with a comprehensive study.

15. In addition to the recommendations that were specifically selected as the basis for the studies that have been submitted to the Committee as indicated in paragraphs 8 and 9 above, other UNISPACE 82 recommendations calling for studies and addressed to the United Nations are given below with information on their implementation.

Paragraph 161

16. It was recommended that the United Nations system examine the implications and potentials of the new developments in communications technology, especially for the developing countries.

17. The United Nations has not conducted a comprehensive study of this question. However, three seminars on applications of satellite communications for development, covering various aspects of this subject, were held as part of the United Nations Programme on Space Applications. Specialists from the International

Telecommunication Union (ITU), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Maritime Satellite Organization (INMARSAT) and the International Telecommunications Satellite Organization (INTELSAT) and other international and national organizations contributed to the seminars on the basis of studies done by those organizations. Reports on those seminars were submitted to the Committee in documents A/AC.105/361, A/AC.105/391 and A/AC.105/416. Three seminars on the topic are planned for 1990 and 1991, and future seminars will be planned to the extent that availability of resources permits.

Paragraph 258

18. It was recommended that the United Nations, in co-operation with appropriate specialized agencies (including, especially, UNESCO) initiate a study on the educational opportunities that emerge from satellite and related telecommunications technologies and support firmly the implementation of studies which have already been carried out and programmes which relate to the use of satellite systems for technical training and education at the regional, subregional and national levels, especially those involving developing countries.

19. In addition to the United Nations study on the use of direct broadcasting satellites for education (A/AC.105/341/Rev.1), four seminars and meetings of experts on the topic of education and space technology were held as part of the United Nations Programme on Space Applications and considered aspects of the question. Reports on the seminars and meetings were submitted to the Committee in documents A/AC.105/365, A/AC.105/378, A/AC.105/390 and A/AC.105/438. A specialist from UNESCO participated in one of the seminars. The United Nations Programme on Space Applications also provided advisory services to China in the development of a project involving the use of communication satellites for education. Otherwise, owing to limited resources, the United Nations has been unable to provide assistance to countries or regions wishing to implement such programmes.

Paragraph 312

20. It was recommended that the United Nations in association with concerned specialized agencies organize studies periodically to examine all the global implications - technical, social, economic, environmental and legal - of new space developments, especially for developing countries.

21. In response to the needs expressed by the developing countries and the views expressed in the Committee, the studies carried out by the United Nations and the activities of the United Nations Programme on Space Applications were concentrated on applications of space technology in the fields of remote sensing, meteorology and communications. Within those fields, the activities covered technical, social, economic, environmental and legal aspects as recommended. Plans are now being developed to increase the consideration of environmental applications and to organize meetings on space science. With the limited resources available, it has not been possible to cover new developments in other areas. The concerned specialized agencies have always been invited to co-operate with the United Nations in space-related activities, and training courses have been jointly organized with

the Food and Agriculture Organization of the United Nations (FAO), UNESCO and the World Meteorological Organization (WMO). Specialists from those agencies and from the United Nations Environmental Programme (UNEP), ITU, the Office of the United Nations Disaster Relief Co-ordinator (UNDRO) and the World Health Organization (WHO) have participated in the activities of the United Nations Programme on Space Applications.

Paragraph 153

22. The United Nations, in association with appropriate specialized agencies, e.g., ITU, through its International Radio Consultative Committee (CCIR) and UNESCO, was requested to make a study of the economic aspects of the use of satellites in low orbit by the developing countries for non-instantaneous communication.

23. The question of low-orbiting communication satellites has not been addressed by United Nations studies or meetings. However, it has been considered by other international organizations and by Member States, and the United Nations has made efforts to follow developments on the subject.

## II. INFORMATION

Paragraphs 211 and 432

24. It was recommended that an information service that acts as a central clearing-house, consisting initially of a directory of sources of information and data services, be established in the Outer Space Affairs Division of the Secretariat (see also paras. 205 and 434).

25. The Outer Space Affairs Division, within its existing resources, has been developing its limited capability for providing information services. The Division has had for some time a collection of books, periodicals and documents relating to space and provides information on request from those sources. In accordance with this recommendation, the Division has published a survey of space activities of the United Nations and the international organizations (A/AC.105/358), a directory of information systems on space science and technology (A/AC.105/397/Rev.1) and a directory of education, training, research and fellowship opportunities in space science and technology and its applications (A/AC.105/432). To examine how information services might best be organized and operated in the field of remote sensing, the United Nations Programme on Space Applications organized an international meeting of experts on remote sensing information systems, a workshop on regional space information systems and a workshop on oceanographic and marine space information systems. The reports on these meetings were submitted to the Committee in documents A/AC.105/343, A/AC.105/422 and A/AC.105/439. The proceedings of the meeting of experts were published jointly by the Federal Republic of Germany Aerospace Research Establishment and the Outer Space Affairs Division. Recently, the Division acquired a number of personal computers and it has been developing a small data base based on the United Nations Registry of objects launched into outer space. The Division does not currently have the

resources to access external data bases electronically or to develop a capability for external computer access to its information system. The Division will be exploring ways to develop further its capabilities for providing Member States with information on request, but, in the absence of additional resources, the implementation of this recommendation will remain very limited.

Paragraphs 214 and 375

26. In the last paragraph, the United Nations was requested to collect, collate and disseminate information on the co-ordination and organizational mechanisms devised by various countries that have had experience in space applications; and in the second paragraph, the United Nations and concerned specialized agencies were requested to examine how best to organize the collection, collation, documentation and dissemination of the experiences of developing countries related to space applications.

27. Both of these recommendations are important focuses of ongoing United Nations activities, particularly those of the United Nations Programme on Space Applications, to provide assistance to developing countries. To improve the dissemination of the experiences and results of space applications activities in developing countries, the Outer Space Affairs Division is initiating publication of an annual series of selected papers from the seminars, workshops and meetings of experts of the Programme, with a focus on papers concerning applications and programmes in developing countries. The Division will be examining ways to promote further the exchange of information concerning the experiences of developing countries. However, the United Nations Programme on Space Applications has no resources specifically allocated for publication or broad dissemination of technical or organizational studies of space activities in developing countries.

## III. EDUCATION AND TRAINING

28. The UNISPACE 82 recommendations relating to education call for activities which will be required on a continuing basis, and hence their implementation will be part of an ongoing process. In general, education is the focus of the United Nations activities relating to space, particularly those of the United Nations Programme on Space Applications. The Programme, which began in 1971, has organized between four and eight training courses, workshops, seminars and meetings of experts each year for the benefit of participants from developing countries. In addition, fellowships for in-depth and long-term training in specialized institutions are being offered each year through the Programme.

Paragraphs 238 and 379

29. In the first paragraph, the United Nations was requested to organize a fellowship programme for in-depth, long-term exposure of selected graduates or postgraduates to space technology or applications. Such exposures on a bilateral or multilateral basis should also be encouraged. On-the-job experience should be included and the training centres should, as far as possible, be in developing nations (see also para. 212). In the second paragraph, UNISPACE 82 recommended

that the United Nations and its specialized agencies actively encourage co-operation in training among developing countries by providing available assistance, inter alia, funding for fellowships.

30. While the United Nations Programme on Space Applications has no funding of its own for long-term fellowships, Member States have offered fellowships through the Programme. For 1989-1990, 40 fellowships were offered by Austria, Brazil, the German Democratic Republic, the Union of Soviet Socialist Republics and the European Space Agency (ESA) for advanced long-term training in scientific and educational institutions in those countries and regional institutions. The majority of the fellowships are for remote sensing, but they also cover space science, space technology, telecommunications and meteorology. The 10 fellowships offered by Brazil are for studies in a developing country. This is a major increase compared with the period before UNISPACE 82, when only a few fellowships a year were offered, and none for studies in developing countries. None the less, the demand for such advanced training continues to be much greater than the number of fellowships available. Since the Programme is dependent on voluntary offers of fellowships, it is not able, on its own, to increase the number for study in developing countries. Additional information on these fellowships are provided in the annual report of the United Nations Expert on Space Applications (A/AC.105/446).

Paragraph 239

31. The United Nations was requested to support the development of appropriate training centres at regional levels, linked whenever possible to institutions implementing space programmes. Necessary funding should be made available through international financial institutions. The training centres should organize - with United Nations assistance if necessary - regular training courses of varying durations for different levels of trainees from developing countries.

32. The United Nations has, whenever possible, co-operated with regional remote sensing centres, through co-operative organization of meetings or by including participants from regional centres in activities organized elsewhere. Since UNISPACE 82, the United Nations Programme on Space Applications has organized two training courses at the Regional Centre for Services in Surveying, Mapping and Remote Sensing at Nairobi and one at the regional Centre for Training and Applications in the fields of Agrometeorology and Operational Hydrology (AGRHYMET) at Niamey. The Programme has also advised to the Regional Centre for Training in Aerospace Surveys (RECTAS) at Ife, Nigeria, in developing and implementing a curriculum for a post-graduate course on remote sensing. A series of four regional meetings to discuss problems relating to educating educators in developing countries has been held as part of the Programme on Space Applications with a view to establishing regional space education centres in developing countries. The reports of those meetings are contained in documents A/AC.105/365, A/AC.105/378, A/AC.105/390 and A/AC.105/438. A five-week training course on education for educators is planned for 1990. However, the Programme does not have resources for material assistance for regional training centres, despite the great demand for such assistance.

Paragraph 240

33. The United Nations, in association, where appropriate, with concerned specialized agencies, was requested to conduct regular three-to-five-week "managerial" seminars for high-level personnel concerned with space applications and technology.

34. The activities of the United Nations Programme on Space Applications have been primarily of two types: two-to-four-week training courses and workshops for technical personnel who use space technology or space-derived data in their regular work; and one or two week seminars and meetings of experts for managers and decision makers whose responsibilities are related to space applications. Owing to their responsibilities, it is often difficult for managers to attend longer courses. While longer managerial courses might be worthwhile, the demand from developing countries and the priorities of the Programme, within its limited resources, have been for shorter managerial seminars.

Paragraph 430

35. It was recommended that the United Nations Programme on Space Applications be directed towards promoting a greater exchange of actual experiences and greater co-operation in space science and technology, developing a fellowship programme, organizing regular seminars, helping the development of indigenous nuclei and an autonomous technological base in countries, disseminating information and providing (or arranging to provide), on request, technical assistance.

36. Following UNISPACE 82, the United Nations Programme on Space Applications was, within available resources, reoriented in accordance with this recommendation. In order to promote greater exchange of actual experiences, more meetings of experts were organized with active participation of experts from developing countries, and, during the seminars, workshops and training courses, more time was allocated for presentations by speakers and participants from developing countries. The Programme has provided financial support for the participation of scientists from developing countries in the congresses and symposia of COSPAR, IAF, the International Society of Photogrammetry and Remote Sensing (ISPRS) and the Latin American Society of Specialists in Remote Sensing (SELPER). The organization of "regular" seminars, in the sense of a planned and structured programme of meetings, has posed a problem for the Programme since its limited resources make it dependent on support from host Governments or organizations for each of its meetings. The only long-term series of meetings has been the International Training Courses on Remote Sensing Applications, organized annually since 1976 in co-operation with FAO and the Government of Italy. The large number of applicants for those training courses testifies to the advantage of regular courses. However, the limited resources available both to the FAO and the United Nations for remote sensing training is now making the future of that regular series of courses uncertain. A number of other meetings have been organized into more or less regular programmes: continuing series of training courses on various aspects of space applications are being hosted by Brazil, the German Democratic Republic and the USSR; a series of five United Nations/FAO/WMO/ESA training courses on remote sensing for hydrometeorology and agrometeorology have been held in various host countries; and

a series of three regional meetings on space applications and education have been held in Africa, Asia and Latin America. Efforts are being made to continue these courses and meetings. To promote the development of indigenous nuclei and an autonomous technological base in developing countries, the efforts of the Programme have focused on educating educators in developing countries, a theme that has been the subject of three regional meetings of experts and will be the subject of a training course in 1990. Plans to translate the conclusions of these meetings into a proposal for regional space education centres in developing regions are being worked out, but the Programme will need the financial support of Member States to assist in the establishment of such centres. The questions of fellowships, information and technical assistance are addressed in other sections of the present paper. Since the resources available to the Programme from the regular budget were not increased following UNISPACE 82, and with new voluntary contributions from only a few countries, the Programme could not be substantially expanded. The new orientations, therefore, required a decrease in other activities, in particular in introductory seminars.

## IV. TECHNICAL ASSISTANCE

37. UNISPACE 82 made a number of recommendations concerning the provision of technical assistance in the areas of space technology and applications by the United Nations. In general, technical assistance, like education and training, is an open-ended process, and implementation of the UNISPACE 82 recommendations is a continuing activity. All of the recommendations have been taken into account in the work of the Outer Space Affairs Division and the United Nations Programme on Space Applications. These recommendations can therefore be considered to be partially implemented. However, the demand for such technical assistance is much greater than can be met by the resources currently available to the United Nations for this purpose.

Paragraphs 149, 157, 191, 192, 212, 215, 222, 249 and 259

38. It was recommended that the United Nations system provide, or arrange to provide, assistance to Member States - on request - for studies related to communication (para. 149), maritime communication requirements (para. 157), and cost-benefit and impact analysis (para. 191); for choices of applications or systems (paras. 192 and 212); for systems studies (para. 215); for co-operative efforts by developing countries (para. 222); for direct broadcast satellite (DBS) feasibility studies (para. 249); and to develop appropriate system configurations for using space technology for education (para. 259).

39. While the United Nations Programme on Space Applications does respond to requests for technical advisory services from Member States whenever possible, it has no funds available for technical assistance. Advisory services can therefore be provided only when minimal or no costs to the Programme are involved. On this basis, the Programme has provided advice to China in developing a satellite communications and education project and to a number of regional projects, as indicated in paragraph 42 below. The major source of funding for technical assistance in the United Nations system is the United Nations Development

Programme (UNDP). UNDP, however, has no resources specifically devoted to space applications, but will fund such projects on the basis of priorities set by the recipient countries. The United Nations Programme on Space Applications has provided advisory services to a number of countries and regional organizations in developing or executing UNDP-funded projects, and two meetings organized by the Programme were funded in part by UNDP as part of regional projects. The demand for advisory services, however, is much greater than can be met from the resources available to the Programme.

Paragraph 243

40. The United Nations and international financing agencies were requested to consider providing all possible help to developing countries in setting up indigenous centres for the absorption, adaptation and development of space technology.

41. The United Nations Programme on Space Applications, in response to the UNISPACE 82 recommendations, has organized a number of regional meetings of experts which have considered the need for indigenous centres for education and research on space technology and applications. The reports of those meetings are contained in documents A/AC.105/365, A/AC.105/378, A/AC.105/390 and A/AC.105/438. Efforts to assist developing countries in setting up indigenous centres is a priority for the Programme, but because the United Nations has no resources allocated for material support for such institutions, financial assistance for such centres would need to be provided as voluntary contributions from Member States and funding agencies.

Paragraphs 353, 376, 378 and 437

42. It was recommended that the United Nations promote initiatives aimed at establishing regional mechanisms and encourage its regional economic bodies to carry out studies that would facilitate their establishment (para. 353); the United Nations and its regional economic commissions play a role in supporting initiatives for regional space activities (para. 376); and the United Nations and its specialized agencies, where necessary, be provided with the means to fund expert missions to define specific, need-based, co-operative programmes between groups of developing nations (para. 378). The Conference recognized that the effective participation of the regional economic commissions in the execution of activities resulting from the recommendations of the Conference necessitated the reinforcement of the role of the regional economic commissions concerned and therefore recommended the provision of adequate resources.

43. Most of the meetings of the United Nations Programme on Space Applications are organized on a regional basis and include discussions of regional co-operation. More specifically related to this recommendation, in addition to the three regional meetings on education, the Programme organized regional meetings of experts on space science and technology and its applications in Asia, the Indian Ocean region and Latin America in order to discuss ways to improve regional co-operation. The reports on those meetings and their recommendations were submitted to the Committee in documents A/AC.105/346, A/AC.105/374 and A/AC.105/375 respectively. Some of the meetings of the Programme were organized in co-operation

with the Economic Commission for Africa (ECA), the Economic and Social Commission for Asia and the Pacific (ESCAP), the Economic and Social Commission for Western Asia (ESCWA) and the Economic Commission for Latin America and the Caribbean (ECLAC). The Programme also provided some advisory services for regional co-operative programmes, including programmes involving the use of remote sensing in Africa, Latin America, the Atlantic coast of Africa region, the Indian Ocean region and the Arab region. In providing these services, the Programme worked in collaboration with the ECA and ESCWA. The Programme did not have the resources to provide any material assistance to the programmes, but assisted in developing projects that were funded by UNDP.

## V. CO-ORDINATING UNITED NATIONS SPACE ACTIVITIES

Paragraphs 435, 436 and 431

44. It was recommended that the ad hoc Sub-Committee on Outer Space Activities of the Administrative Committee on Co-ordination continue to meet annually. It should discuss ways of ensuring closer co-ordination between the various agencies concerned and should also examine the feasibility of using each other's expertise more fully through joint co-operative programmes. All space-related programmes of each of the agencies should be discussed and co-ordinated at this forum before finalization. The procedures of co-ordination should be such as to minimize delays in implementation (para. 435). The proposed Centre for Outer Space or the Outer Space Affairs Division with enlarged responsibilities should work in close co-operation with the various technical agencies in the United Nations system as well as with funding agencies so that proper co-ordination of projects is ensured within the United Nations system (para. 436). The activities of other units of the United Nations system involved in space activities must be continued and strengthened, as appropriate, but with special emphasis on the imperative need to avoid duplication of programmes and to achieve full co-ordination in this field (para. 431).

45. United Nations space activities continue to be co-ordinated through the annual sessions of the Inter-Agency Meeting on Outer Space Activities, as well as through informal channels. The 1989 session of the Inter-Agency Meeting included participants from the Outer Space Affairs Division, the Office of Legal Affairs, the Department of Technical Co-operation for Development, the Centre for Science and Technology for Development, ESCAP, ECA, UNEP, UNDP, the European office of the United Nations Institute for Training and Research (UNITAR), FAO, UNESCO, WHO, ITU and WMO. The report of that meeting is contained in document ACC/1989/PG/8. The United Nations Programme on Space Applications has co-operated with FAO, UNESCO and WMO in organizing training courses, and specialists from those agencies and from UNEP, ITU, UNDRO and WHO have participated in the Programme's activities.

## VI. POLICY ISSUES

46. The recommendations of UNISPACE 82 included a number of recommendations addressed to the General Assembly and the Committee and dealing with legal and policy questions within the mandate of the Committee.

Paragraph 174

47. It was recommended that the current discussion in the Committee on principles governing satellite remote sensing be completed expeditiously (see also para. 225).

48. In 1986, the Committee reached agreement on and recommended the adoption of a set of principles relating to remote sensing of the Earth from outer space. These principles were adopted by the General Assembly in resolution 41/65 of 3 December 1986.

Paragraph 423

49. The proposed new or expanded activities, including personnel costs, of the United Nations were to be funded mainly through voluntary contributions of States, either in money or in kind. It was recommended that the General Assembly, through its competent organs, rearrange priorities within the United Nations next regular budget in such a way that the modest increase in personnel costs might be absorbed within the available resources.

50. Following UNISPACE 82, one additional post was created in the Outer Space Affairs Division, within the regular budget, to support the additional activities undertaken in response to the recommendations. The allocation from the regular budget for the activities of the United Nations Programme on Space Applications, about $115,000 for 1989, has remained essentially constant, with a small increase to allow for inflation, since the mid-1970s, except for 1986 and 1987 when, owing to the financial crisis, the allocation for the Programme was reduced to about $50,000 per year. Since UNISPACE 82, voluntary contributions have been received from a number of States to support the activities of the Programme for the benefit of developing countries. Voluntary financial contributions, amounting to a total of $216,718 since 1982, have been received from Austria, Cameroon, Chile, China, Cyprus, Dominican Republic, Nigeria, Pakistan and Sweden. Voluntary contributions in the form of fellowships, facilities and services for Programme activities and speakers for seminars and training courses were provided by many other countries and international organizations. While it is difficult to assess the financial value of these contributions in kind, it would appear that their value is substantially greater than the allocation from the regular budget.

Paragraph 426

51. It was strongly recommended that the competent organs of the United Nations, in particular the General Assembly and also the Committee on Disarmament, when dealing with measures aimed at a prevention of an arms race in outer space, in particular those mentioned in the relevant resolutions of the General Assembly, give appropriate attention and high priority to the grave concern expressed in paragraphs 13 and 14 of the UNISPACE 82 report.

52. The General Assembly, through its First Committee, which deals with disarmament questions, has considered the question of the prevention of an arms race in outer space since before UNISPACE 82. The Committee on Disarmament, since 1982, has been considering the question of the prevention of an arms race in outer space. Since 1985, an ad hoc committee established by the Conference on Disarmament has been considering this question.

Paragraph 427

53. It was recommended that the Committee have on its agenda regular items pertaining to the follow-up of Conference recommendations.

54. The Scientific and Technical Sub-Committee has, since 1983, been considering, as an agenda item, the question of implementing the recommendations of UNISPACE 82. The Committee has considered this question in its consideration of the report of the Scientific and Technical Sub-Committee.

Paragraph 434

55. It was recommended that consideration be given to an integration of the expanded activities (mentioned in para. 434) into a Centre for Outer Space, which would consist of the Outer Space Affairs Division of the Department of Political and Security Council Affairs. Alternatively, the proposed integration and expansion could take place within the existing Outer Space Affairs Division strengthened with additional personnel and resources. It was requested that the General Assembly consider both alternatives at its thirty-seventh session.

56. In accordance with the decisions of the General Assembly, the activities recommended by UNISPACE 82 have been carried out within the Outer Space Affairs Division, with the addition of one Professional post following the Conference. As of 1990, however, as a result of the retrenchment exercise, the Division will lose one Professional and one General Service post and hence will have fewer personnel than before UNISPACE 82.

Notes

1/ Official Records of the General Assembly, Forty-fourth Session, Supplement No. 20 (A/44/20), para. 28.

2/ Report of the Second United Nations Conference on the Exploration of the Peaceful Uses of Outer Space, Vienna, 9-21 August 1982.

## Annex I

## RECOMMENDATIONS ADDRESSED TO SPECIALIZED AGENCIES

Paragraphs 68 and 69. It is desirable that ITU continue to study the optimum allocation of bands for various services, the criteria for sharing, and the use of the geostationary orbit (GSO), with a view to adopting appropriate changes of future World Administrative Radio Conferences or Regional Radio Conferences (para. 68). In this regard, careful studies of various trade-offs are needed to arrive at an optimum solution (para. 69).

Paragraph 89. WMO should be encouraged to continue its examination of the feasibility of setting up regional or international centres for meteorological data reception and analysis.

Paragraph 148. Studies about the importance of communication (especially rural communication) as an element of development should be undertaken by appropriate United Nations agencies - especially ITU and UNESCO. Adequate funding for systems (national and regional) that aim to strengthen the communications infrastructure should be provided by funding institutions.

Paragraph 159. It is desirable that studies on an operational aeronautical communication system be continued by ICAO and INMARSAT (see also para. 75).

Paragraph 173. The organizations of the United Nations system (FAO, UNESCO, UNDP and UNEP) should strengthen their programmes and encourage dialogues among Member States so that interested countries could (a) take steps to study the remote sensing needs and assess appropriate remote sensing systems to meet them; and (b) engage in dialogues between users/potential users and designers/producers of satellite systems in order to determine user needs and the extent to which those needs can be met. The regional commissions, with the assistance of the United Nations system, should carry out the necessary studies on the most efficient and practical ways of co-operation among the countries in their respective regions, on space activities; and, as appropriate, on mechanisms for their implementation.

Paragraph 189. The operational applications, manufacturing or processing in space, space power systems, etc., are probably many years away, but it is already time to examine their relevance and their implications. Their possible biological, ecological and radio-frequency interference impacts must therefore be studied and identified by ITU and other United Nations agencies with the necessary information to decide on them.

Paragraph 211. It is recommended that data banks at national and international levels should be strengthened and expanded and existing international satellite data banks (including especially those in the Remote Sensing Centre of FAO and in the Natural Resources and Energy Division of the Department of Technical Co-operation for Development of the Secretariat) be strengthened in so far as required to support regional and national centres. It is also recommended that FAO Remote Sensing Centre and regional centres for remote sensing should also continue

to assist Member States in the development of remote sensing of renewable resources, including the provision of training.

Paragraph 224. All countries should continue to have free access to meteorological data and WMO should be encouraged to ensure optimal use of space techniques, in particular in the related aspects of facilities for data reception and processing, data analysis and dissemination. WMO should also envisage undertaking a study concerning the possibility of setting up an international structure providing access to satellite meteorological data.

Paragraph 264. WMO should continue to actively promote international co-operation in space meteorology, encourage compatibility and complementarity between different systems and take all necessary steps to ensure continuity of data availability to all countries.

Paragraph 283. ITU should examine the feasibility of incorporating in its future regulations a stipulation that each satellite owner is responsible for removing its satellites from GSO, when they are no longer usable to be able to have spare satellites in the orbit.

Paragraphs 284 and 286. It is desirable that States members of ITU continue to evolve some criteria for the most equitable and efficient usage of GSO and the radio frequency spectrum and to develop planning methods and/or arrangements that are based on the genuine needs, both present and future, identified by each country. Such a planning method should take into account the specific needs of the developing countries, as well as the special geographical situation of particular countries (para. 284). It should also be flexible enough to permit the introduction of new types of systems taking into account the needs and requirements of all countries (para. 286).

Paragraph 299. An integrated global ozone observing system should be created under the aegis of WMO and UNEP.

Paragraph 300. World-wide monitoring of the Earth's environment and necessary remedial action should be co-ordinated by UNEP. All countries should provide promptly all relevant data required for such monitoring purposes to UNEP.

## Annex II

## RECOMMENDATIONS ADDRESSED TO OTHER INTERNATIONAL ORGANIZATIONS

Paragraph 75. It is desirable that technologies and systems be developed that will enable smaller ships to use satellites for maritime communication.

Paragraph 77. It is necessary that all possible encouragement and assistance be provided - especially to developing countries - to undertake basic science pursuits.

Paragraph 157. INMARSAT (with ITU and IMO) should continue its efforts to develop smaller and quite inexpensive ship-borne terminals for communications, distress and safety applications. It should examine necessary changes in the overall system design to enable greater usage by developing countries (see also para. 75).

Paragraph 176. Access to data from operational meteorological satellites is free, and because many countries have become dependent upon this system, it is necessary to ensure continuation and intensification of such services.

Paragraph 185. In view of the importance and humanitarian nature of search and rescue systems, it is desirable that the present co-operation be continued and efforts be made to evolve a world-wide operational satellite-based search and rescue system as soon as possible.

Paragraph 223. International financial agencies should provide financial support, as appropriate, for demonstration projects undertaken by developing countries.

Paragraph 227. A study should be undertaken to assess the need for and viability of a world-wide remote sensing system.

Paragraph 230. The feasibility and desirability of specially designed systems for rural telecommunications should be examined. It is also most desirable to examine whether such systems could become available on a non-profit basis.

Paragraph 249. Organizations such as INTELSAT may choose to consider developing broadcasting satellite systems which could be used for educational purposes.

Paragraph 274. It is recommended that a study be made of the feasibility of establishing an international satellite navigation system with the active participation of all States.

Paragraph 285. The feasibility and overall advantages of using elliptical orbits for international communication merit re-examination.

Paragraph 304. The feasibility of undertaking a joint international effort with regard to solar power satellites (SPS) should be examined and - as a corollary - the means of sharing internationally the benefits that result.

Paragraph 371. International funding and technical assistance agencies, when providing expertise assistance, might first seek the necessary experts from developing countries.

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